The Saskatchewan
Agricultural Research
Fund

Annual Report 1982-83

Saskatchewan Agriculture

The Saskatchewan Agricultural Research Fund

The Saskatchewan Agricultural Research Fund

To His Honour,
The Honourable Fredrick W. Johnson
Lieutenant Governor of the Province
of Saskatchewan

Sir:

I have the honour to submit the Fourth Annual Report of the Saskatchewan Agricultural Research Fund for the period April 1, 1982 to March 31, 1983.

I have the honour to be Sir,

Your obedient servant
Lorne H. Hepworth
Minister of Agriculture

The Saskatchewan Agricultural Research Fund

Honourable Lorne Hepworth
Minister of Agriculture

Dear Sir:

It is my pleasure to present the Fourth Annual Report of the Saskatchewan Agricultural Research Fund for the period April 1, 1982 to March 31, 1983.

Respectfully submitted

J.L. Drew
Deputy Minister of Agriculture

The Saskatchewan Agricultural Research Fund

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I am pleased to present the Fourth Annual Report of the Saskatchewan Agricultural Research Fund for the period April 1, 1982 to March 31, 1983.

Respectfully submitted

Lloyd Loyns
Chairman of the Saskatchewan
Agricultural Research Fund

Introduction

The Saskatchewan Agricultural Research Fund was established by the June 15, 1979, proclamation of The Agricultural Research Funding Act. The Fund consists of such money as may be appropriated annually by the Legislature, plus other money which may be transferred into the Fund by the Lieutenant Governor-in-Council. It serves as a capital fund from which the annual earned interest is made available to individuals, corporations, co-operatives, associations or other organizations for the purpose of agricultural research in the Province. Applications are invited annually from interested parties. Initial appropriation for 1979–1980 fiscal year was $3.25 million.

The Fund is administered by a producer-represented Board which has authority to make grants, loans or guarantees or enter into agreements or contracts respecting assistance provided to persons. The Board as appointed by the Lieutenant Governor-in-Council, consists of seven persons, including four practising agricultural producers, two agricultural research professionals and one Saskatchewan Department of Agriculture representative. The Chairman and Vice-Chairman of the Board are designated by the Lieutenant Governor-in-Council. The Board is responsible to the Minister of Agriculture.

Activities 1982–83

In 1982 16 applications for new projects were approved for a total of $231,300. Nine projects totalling $155,500 received approval for their second year of research. 15 third year projects were awarded a total of $283,600. One 1982–83 project received an increase of $1,600 for its second year. The Fund received 104 applications requesting a total of approximately $2 million.

Abstracts of the 22 second year projects and 15 first year projects are printed in this report. More detailed reports are available as a separate publication.

Audited financial statements of the Fund, as provided by the Provincial Auditor, are presented herein as the final section of this report.

The Board extends their appreciation to all who submitted applications in 1982 and hopes that this degree of interest will be maintained. They look forward to great benefits to agriculture from the research that will be forthcoming.

Saskatchewan Agricultural Research Fund Board 1982–83

CHAIRMAN:	**Mr. Lloyd Loyns** LAC VERT, S0K 2G0
VICE-CHAIRMAN:	**Dr. J. Milton Bell** Department of Animal and Poultry Science University of Saskatchewan SASKATOON, S7N 0W0
MEMBER:	**Mr. Lynn Biggart** CUT KNIFE, S0M 0N0
MEMBER:	**Mr. Ian Boyes** KELVINGTON, S0A 1W0
MEMBER:	**Mr. Bev Currie** P.O. Box 852 SWIFT CURRENT, S9H 3W9
MEMBER:	**Dr. Ross Greenshields** 32 Simpson Crescent SASKATOON, S7H 3C6
MEMBER:	**Dr. Alfred Slinkard** Crop Development Centre University of Saskatchewan SASKATOON, S7N 0W0
SECRETARY:	**Ms. Brenda R. Machin** Saskatchewan Agriculture 3085 Albert Street REGINA, S4S 0B1

Distribution of Projects and Funding by Program Area

Program Area	Awarded 1981–82	Awarded 1982–83	% of Total Awarded 1981–82	% of Total Awarded 1982–83	Assigned 1981–82	Assigned 1982–83	% of Total Assigned 1981–82	% of Total Assigned 1982–83
Cereal Crops	4	5	10.9	12.5	79,675	96,500	13.4	14.4
Special Crops	6	7	16.2	17.5	96,700	118,800	16.2	17.7
Forage Crops	3	3	8.1	7.5	30,150	45,100	5.1	6.7
Horticultural Crops	3	4	8.1	10.0	26,617	39,600	4.5	5.9
Ruminants	6	7	16.2	17.5	109,458	128,100	18.4	19.1
Non-Ruminants	6	6	16.2	15.0	130,639	125,000	21.9	18.6
Land, Air, Water	3	3	8.1	7.5	48,000	60,500	8.0	9.0
Energy & Equipment	3	0	8.1	—	26,180	—	4.4	—
Socio-Economics	1	3	2.7	7.5	10,000	31,900	1.7	4.7
Miscellaneous	2	2	5.4	5.0	38,230	26,500	6.4	3.9
Totals	37	40			595,649	672,000		

Approved Projects 1982

Title	Research Manager	Institution	1982 Grant
Cereal Crops			
The Evaluation of the Nitrogen Requirements for Cereal Grains Grown Under the Zero Till Farming System	Dr. D.A. Rennie	Department of Soil Science U of S	$22,000.00
The Inheritance and Nature of Sprouting Resistance in Barley	Dr. B.L. Harvey	Crop Science & Plant Ecology Department U of S	$25,000.00
The Role of Supercooling in Herbacious Plants in Preventing Frost Damage	Dr. L.V. Gusta	Crop Development Centre U of S	$20,000.00
Influence of Nitrogen Fertilizer on the Agronomic Performance and Quality of "Stubbled-In" Winter Wheat (Triticum Aestivum L.)	Dr. D.B. Fowler	Crop Development Centre U of S	$15,000.00
Variability in Spring Wheat for Rapid Germination and Seedling Vigour at Low Temperature	Dr. G.R. Hughes	Crop Science & Plant Ecology Department U of S	$14,500.00
Special Crops			
Improved Management Practices for Canaryseed Production in Saskatchewan	Dr. A.E. Slinkard	Crop Development Centre U of S	$12,000.00
Rapeseed Meal and Rapeseed By-Product Evaluation and Utilization	Dr. J.M. Bell	Department of Animal & Poultry Science U of S	$30,000.00
Biology and Control of Ascochyta Blight of Lentils	Dr. R.R.A. Morrall	Department of Biology U of S	$16,500.00
Factors Affecting Soil Persistance of Triazine Herbicides Used on Triazine Resistant Rapeseed	Dr. R.B. McKercher	Department of Soil Science U of S	$16,600.00
Evaluation of Four Sunflower Hybrids at Three Fertilizer Regimes and Six Locations in Saskatchewan	R.E. Morgan/ B.S. Aulakh	Product Development Farm Service Saskatchewan Wheat Pool	$11,800.00
Evaluation of Crude Vegetable Oils for Use in the Petro Chemical Industry	Mark Picard	C.S.P. Foods Saskatoon	$13,500.00
The Development of Recommendations for Economic Seeding Rates of Faba Beans and Broadbeans and an Evaluation of Seeders for Sowing Pulse Crops	Dr. G.G. Rowland	Crop Development Centre U of S	$16,800.00

Forage Crops			
Breeding Leafcutter Bees Adapted to the Saskatchewan Environment	Dr. G.H. Rank	Department of Biology U of S	$6,200.00
Fertilizer Requirements of Grazed Seeded Grass Pastures and the Effects on Nutrition and Production of Beef Cattle and Subsequent Performance on Winter Feed	Dr. R.D.H. Cohen	Department of Animal & Poultry Science U of S	$25,000.00
An Evaluation of Winter Hardiness in Saskatchewan Forage Grasses	Dr. A.E. Limin	Crop Science & Plant Ecology Department U of S	$13,900.00
Horticultural Crops			
Evaluation of Day Neutral Strawberries for Commercial Production in Saskatchewan	Dr. C. Stushnoff	Department of Horticultural Science U of S	$15,000.00
Utilization of Waste-heat from a Potash Mine for Protected Cultivation	Dr. E.A. Maginnes	Department of Horticultural Science U of S	$14,000.00
Weed Control in Commercially Produced Onions	Dr. D.H. Dabbs	Department of Horticultural Science U of S	$7,800.00
Vegetable Varietal Trial	C. Oliver Green	Prairie Produce Ltd. Outlook	$2,800.00
Ruminants			
Intensification of Sheep Production Under Prairie Conditions	Dr. N.C. Rawlings	WCVM	$30,000.00
The Evaluation of Effects of Sulfates and Other Elements in Drinking Water on Trace Mineral Requirements of Cattle	Dr. C.M. Williams	Department of Animal & Poultry Science U of S	$24,000.00
Embryo Transfer in the Cow: Effect of GnRH and Estradiol on Superovulatory Response with FSH	Dr. R.J. Mapletoft	WCVM	$20,000.00
B-Carotene Nutrition and Reproduction in Beef Cattle	Dr. B. Laarveld	Department of Animal & Poultry Science U of S	$18,000.00
Potassium & Sodium Bicarbonates as Buffers for High Concentrate Dairy Rations	Dr. D.A. Christensen	Department of Animal & Poultry Science U of S	$16,400.00

The Evaluation of Selenium and Copper Status in Domestic Animals Using Copper or Selenium-dependent Enzyme Assays	Dr. B.R. Blakley	WCVM	$9,900.00
An Evaluation of the Effects on Livestock Accidently Ingesting Low Levels of Pesticides and Herbicides	Dr. R.K. Chaplin	WCVM	$9,800.00
Non-Ruminants			
Home Range and Migration in Pest Garter Snake, *Thamnophis radix haydeni*	Dr. D.M. Secoy	Biology Department U of R	$5,000.00
The Economics of Wheat and Grain/Protein Ratios in Growing/Finishing Hog Rations	Dr. R. Blair	Prairie Swine Centre U of S	$25,000.00
The Influence of Nutritional Density on the Productivity of Chicken Broilers	Dr. H.L. Classen	Department of Animal & Poultry Science U of S	$30,000.00
Traction of Sows on Farrowing Crate Floors	Dr. G.I. Christison	Department of Animal & Poultry Science U of S	$26,000.00
A Feeding Regime for Early Weaned Piglets Based on the Natural Behaviour of the Piglet	Dr. N.J. Lewis	Department of Animal & Poultry Science U of S	$23,000.00
The Feasibility of Utilizing Saskatchewan Reared Honeybee Queens in Commercial Honey Production	T. Taylor and S. Clifford	Nipawin	$16,000.00
Land, Air, Water			
Ground Water Irrigation	Dr. J.A. Gillies	Department of Agricultural Engineering U of S	$12,500.00
Micronutrient Status and Transformations in Saskatchewan Soils	Dr. R.E. Karamanos/ Dr. J.J. Germida	Department of Soil Science U of S	$30,000.00
Studies on the Efficient Utilization of Liquid Hog Manure	Dr. L.A. McLean	Department of Crop Science & Plant Ecology U of S	$18,000.00
Socio-Economics			
Economic Analysis of International Durum Wheat Market	Dr. Kulshreshtha	Agricultural Economics Department U of S	$10,500.00
An International Analyses of the Canadian and International Flaxseed Markets	Dr. G.G. Storey	Agricultural Economics Department U of S	$9,600.00

An Analysis of Cash Flow Patterns for a Representative Sample of Saskatchewan Family Farms	W.W. Gamble	Saskatoon	$11,800.00
Miscellaneous			
Production of New Variety of Whey and Sugar Fermenting Bacteria Through Applied Genetics	Dr. Khachatourians	Applied Microbiology and Food Science Department U of S	$11,500.00
Functional Properties of Potential New Binders in Processed Meats	Dr. A.R. McCurdy	Applied Microbiology and Food Science Department U of S	$15,000.00

Abstracts of Approved Projects 1981

Cereal Crops

Effects of the Rate and Date of Preseeding Fertilizer Placement and Postseeding Packing Requirements When Using a Pneumatic Seeder

L.A. McLean
Crop Science Department
University of Saskatchewan

$18,000.00

Phosphorus fertilizer was applied at 4 rates and 3 dates at 3 locations with a fourth location initiated using 3 rates and 2 dates on a Weyburn soil. Preliminary yield data indicates a normal response to phosphorus levels with possibly small differences due to method of application. Packing was found to increase seed emergence, reduce grain moisture at maturity and increase wheat yield. This response was not as dramatic in 1982 as in the dry year of 1981.

The Evaluation of the Nitrogen Requirements for Cereal Grains Grown Under the Zero Till Farming System

M.C.J. Grevers and
D.A. Rennie
Department of Soil Science
University of Saskatchewan

$20,000.00

A fertilizer nitrogen placement study was initiated at 3 locations: at Drinkwater, winter wheat on a heavy clay; at Leipzig, spring wheat on a loam; and at Kindersley, barley (Z-till) and wheat (C-till) on a clay loam. The placements were fall broadcast, winter broadcast, spring broadcast, fall deep band, spring deep band, fall seed-place and spring seed-place. Fertilizer nitrogen rates were 67 and 134 kg N/ha. Crop yield and quality, moisture use, and fertilizer nitrogen uptake were measured along with other agronomic data.

For spring cereals grown under Z-till, spring deep band and spring seed-place were superior fertilizer nitrogen placement methods. Winter broadcast nitrogen was a good alternative where successful snow trapping had been achieved. Winter wheat grown under Z-till responded best to spring broadcast and fall deep band nitrogen. Under C-till yield increases due to fertilizer nitrogen were far less dramatic. Spring broadcast and fall deep band nitrogen were the more successful placement methods.

Percent fertilizer N recovery was also assessed using ^{15}N tracers. Data from this work indicate higher fertilizer N recovery under Z-till. Deep band nitrogen resulted in higher percent recovery than broadcast nitrogen under Z-till.

Soil physical properties affecting soil fertility were measured at 6 locations which had been under Z-till for at least 4 years. Differences between soils under Z-till and C-till were quite small especially in the soils of heavy clay texture. Aggregates were found to be larger under Z-till while gaseous diffusion was also higher thus indicating a more continuous pore system under Z-till. Results on bulk densities and aeration porosities were inconsistent. Percent carbon and percent polysaccharides of the aggregates showed no clear trend due to tillage treatment. The soil temperature regime during the growing season showed that at one site soil temperatures were an average of 3°C cooler under Z-till at 5 cm depth and 0.5-1.0°C cooler at 10 cm depth.

The Inheritance and Nature of Sprouting Resistance in Barley

B.L. Harvey,
B.G. Rossnagel &
R.P. Muderewich
Crop Science Department
University of Saskatchewan

$24,800.00

A source of dormancy WM143-2-3b, was generously made available to us by Dr. D.R. Metcalfe. We crossed WM143-2-3b with Norbert, Fairfield and S77433. Norbert is highly

susceptible to sprouting, Fairfield has a small amount of dormancy and S77433 is hulless and non dormant.

The following tentative conclusions have been drawn from the preliminary observations we have made to date. The dormancy factor(s) appears to be located in the hulls. The inheritance of dormancy is quantitative and of medium heritability. It should be possible to select segregants with adequate levels of sprouting resistance. It will be difficult, however, to select sprouting resistant types with good malting quality since there is a positive relationship between sprouting susceptibility and amylolytic enzyme activity.

Frost Tolerance and Supercooling in Economic Crops

L.V. Gusta $16,875.00
Crop Development Centre
Saskatoon

The formation of ice plants at sub-zero temperatures is due to the presence of ice nucleators. The most efficient nucleator for ice formation is ice itself although certain bacteria growing on leaves are very effective. The frost tolerance of cultivars of wheat, barley, oats, rape and mustard was determined at different stages of growth. The ability of plants to supercool or avoid frosts was determined in the presence and absence of ice nucleating bacteria. In order of frost tolerance, mustard and canola are the least tolerant species tested. The cotyledon stage of canola and mustard is the most sensitive stage of growth to frosts. The true leaves are approximately 1°C more frost tolerant than the cotyledons.

Leaves of wheat, barley and oats not infected with ice nucleating bacteria readily supercool or avoid frosts to temperatures as low as -9° to -10°C. Plants infected with ice nucleating bacteria freeze at approximately -4° to -5°C, but can tolerate temperatures as low as -6° to -8°C without visible signs of damage. Of the three species, oats appear to be the most frost sensitive. The effect of various levels of frosts at different stages of development on yield, date of maturity, height, seed weight and germination is still being investigated.

Special Crops

Improved Management Practices for Canaryseed Production

A.E. Slinkard and $11,000.00
B.N. Drew
Crop Development Centre
Saskatoon

Results from on-farm trials indicate that canaryseed yields increased as seeding rate increased up to about 60 kg/ha in 1982 (a wet year) in contrast to lack of a yield increase at seeding rates above 22 kg/ha in 1981 (a dry year). Thus, a seeding rate of 30-35 kg/ha is a good compromise. The yields of Alden and Keet were comparable. Stubble-seeded canaryseed yielded 84% of comparable fallow-seeded canaryseed in 1982 (a wet year) in contrast to only 51% in 1981 (a dry year). On average, canaryseed is less drought tolerant than wheat. Good responses to N and P_2O_5 fertilizer were obtained in 1982 (a wet year) in contrast to the lack of response in 1981 (a dry year). Seed yield was markedly reduced by seeding too deep (≥8 cm) or by not using Avadex BW in a field that was heavily infested with wild oats. Difenzoquat (AVENGE) and flamprop methyl (MATAVEN) were registered for wild oat control in canaryseed. A large number of other herbicides were found acceptable for weed control in canaryseed and attempts will be made to get some of them registered for use in canaryseed production.

Rapeseed Meal and Rapeseed By-Product Evaluation and Utilization

J.M. Bell $34,330.00
Department of Animal & Poultry Science
University of Saskatchewan

A feeding trial involving 144 crossbred pigs was conducted to determine when and under what conditions canola meal can most effectively be introduced into the feeding program for market pigs. Canola meal was fed commencing at 23, 34 or 45 kg pig weights, replacing soybean meal. The meal was fed with and without supplementary lysine. The basal grain used was barley compared with barley:wheat fed in a 2:1 ratio, in order to assess the effects of dietary energy level when canola meal was used. The main results of the first replicate of 72 pigs are reported. The inclusion of wheat did not improve the growth or feed utilization of the pigs. The addition of lysine to diets containing canola meal improved growth rate and efficiency of feed utilization during the first half of the growing period. However, those pigs that were not fed supplemental lysine during early life had largely overcome their earlier nutritional disadvantages by the time they weighed 68 kg and showed no effects of early deficiency of lysine during their finishing phase (68-102 kg). There appeared to be a slight acceptance (palatability) problem with canola meal whenever first introduced. Lysine supplementation of canola meal allowed efficiency of feed utilization to equal that obtained on soybean meal diets. Good quality barley provided ample digestible energy intakes to complement canola meal and to permit normal growth and good efficiency of feed utilization.

Biology and Control of Ascochyta Blight of Lentils

R.A.A. Morrall $14,250.00
Department of Biology
University of Saskatchewan

Most experiments in 1982 were designed to confirm previous results, but the abnormal weather conditions during the growing season severely hampered progress with field aspects of

the project. The two underlying problems were failure of plants to mature and consequently extremely low yields, plus very severe disease pressure which probably tended to mask the effects of treatments on seed quality. Laird lentils again proved to be consistently more resistant than Eston or Commercial, and it was shown that the best time to measure disease levels for comparative purposes and yield prediction is in mid-season, not just before harvest as has traditionally been done. Desiccants applied before harvest may help to reduce ascochyta development on seed in the swath, but further work is necessary to confirm this. Soil temperature and, hence, seeding date affects the frequency of transmission of ascochyta from seed to seedling. However, although all experiments have shown consistent trends of increased transmission with lower temperatures, results have been erratic and frequency of transmission sometimes extremely low. Future work will include an in-depth study of the efficacy and cost-benefit ratios of foliar application of fungicides to control disease in mid-season.

Factors Affecting Soil Persistence of Triazine Herbicides Used With Triazine Resistant Rapeseed

R.B. McKercher $15,450.00
and R. Ashford
Department Soil Science
University of Saskatchewan

The development of triazine-resistant rapeseed provides a means for chemical control of stinkweed and mustard in rapeseed. The most promising chemicals for this purpose are the various substituted triazines (s-triazine). However, little research has been conducted on these chemicals with different soil types in Saskatchewan. Three chemicals, metribuzin, cyanazine and atrazine (Simazine) are being tested on a range of Saskatchewan soils of varying organic matter and texture. The tests include field testing and laboratory bioassay and gas chromatography analyses. Analyses are incomplete but from those available it seems that residues will not be a problem in Melfort soils and that in other soils, two near Saskatoon and one near Scott, that the level of residues is not high especially for cyanazine and metribuzin.

Final conclusions await the 1983 cropping season and completion of the analyses.

Use of Triazine Herbicides in North Eastern Saskatchewan

Ken Goudy $6,600.00
Melfort

The use of s-triazines could well offer the only real solution to controlling the serious broadleaf weed problem in rape. One of the chemicals, specifically atrazine has resulted in serious residual problems with crops in subsequent years where this product has been used. Research and demonstration plot work to date, carried out on high organic matter and finer textured soils of northeastern Saskatchewan, has shown great promise for the use of the s-triazines metribuzin, cyanazine and even atrazine on triazine resistant rape.

The Development of Recommendations for Economic Seeding Rates of Faba Beans and an Evaluation of Seeders for Sowing Pulse Crops

G.G. Rowland, $16,670.00
R. Graf and
R. Kehrig
Crop Development Centre
Saskatoon

The faba bean cultivar Outlook and the population Chinese Broad Bean were sown at six densities ranging from 13 to 75 plants/m^2 at both Saskatoon and Hagen. For Outlook a maximum yield was reached between 25 to 37 plants/m^2 while for Chinese Broad Bean it was 37 to 50 plants/m^2. At Saskatoon the fertilization frequency of flowers of the Chinese Broad Bean was higher than Outlook and plant density appeared to have no significant effect on this character.

To date 12 companies have supplied 15 seed cups for evaluation with pulse crops. A testing system has been designed to test these seed cups both in the laboratory and the field.

Forage Crops

Breeding Leafcutting Bees Adapted to the Saskatchewan Environment

G.H. Rank $5,850.00
Department of Biology
University of Saskatchewan

The second round of selections in a commercial population was made. Apparently superior females were identified on the basis of their ability to fill tunnels more quickly under three different environment conditions. Selections from the previous year were evaluated in three different field locations. Drifting within sites was evaluated by marking a small population of bees with paint on the upper thorax. Over the summer the number of filled tunnels was monitored on a weekly basis. A comparison of strains was performed in the laboratory during the winter months to evaluate the following: cocoon weight, pupal weight, parasite infestation, sex ratio, diapause development, emergence time, and chromosome morphology.

Development of a Trisomic Series in Russian Wildrye (Elymus Junceus)

G. Scoles $13,000.00
Crop Science Department
University of Saskatchewan

The aim of this project is to create and then evaluate lines of Russian Wild Ryegrass *(Elymus junceus)* carrying an extra chromosome. These lines will be of value in associating traits such as height, maturity, leafiness, forage yield and quality with specific chromosomes. Such

knowledge will be of use in breeding new cultivars of this species. Almost 100 plants carrying an extra chromosome have been examined. From this material six of the seven possible trisomics have been identified.

An Evaluation of Winter Hardiness in Saskatchewan Forage Grasses

A.E. Limin and $11,300.00
D.B. Fowler
Crop Science Department
University of Saskatchewan

In a climate such as Saskatchewan's the possibility of winter injury and reduced productivity of forage crops cannot be overlooked. When a forage variety is chosen, care must be taken that it has adequate hardiness characteristics for the area in which it is to be grown. This project was initiated to evaluate the winter hardiness of forage grasses grown in Saskatchewan. Factors to be evaluated are: the relative levels of cold hardiness of recommended forage varieties in the seedling stage as well as in established stands, the rate of cold hardening in the fall and the rate of dehardening in the spring, the mechanism of winter survival used by several species.

The cold hardiness level of 36 forage varieties grown in Saskatchewan has been evaluated in the seedling stage. Although there is considerable overlap in the levels of varietal hardiness between species, a general ranking can be given as follows from the least to the most hardy: orchard grass, slender wheatgrass, northern wheatgrass, western wheatgrass, streambank wheatgrass, smooth bromegrass, meadow bromegrass, reed canary grass, altai wild ryegrass, crested wheatgrass, timothy, hard fescue, creeping red fescue, creeping bentgrass, Russian wild ryegrass, intermediate wheatgrass, bluegrass, tall wheatgrass. These results should provide a valuable guide to farmers considering fall planting of a forage variety. In many areas of the province fall planting of those varieties which are at the non-hardy end of the scale would mean a considerable risk of winter-kill. The most hardy forage varieties at the seedling stage are approximately equal in cold hardiness to the winter wheat variety Norstar. Preliminary results of several fall acclimated varieties from established stands indicate that considerably greater hardiness is reached, and the ranking of varieties is changed, as compared to the seedling stage.

Horticultural Crops

Weed Control in Commercially Produced Onions

D.H. Dabbs $7,500.00
Department of Horticulture
University of Saskatchewan

A rather wide range of herbicides and herbicide combinations were assessed on this crop in 1982. Some of these had been tested previously, but several of them were new. A number of treatments performed extremely well. Within the very limited number of presently registered herbicides the best combination was CIPC at 3.0 kg ai/ha applied early postplant, followed by Hoegrass at 1.0 kg ai/ha when the grassy weeds had 1 to 4 leaves, in turn, followed by Totril at 0.5 kg ai/ha when the onions had three leaves. Even this relatively low rate of CIPC showed some phytotoxicity to germinating onions on a sandy loam soil with a very low organic matter content. Both propachlor (Ramrod) and pendimethalin (Prowl) showed promise as a possible replacement for CIPC.

Utilization of Waste-Heat From a Potash Mine for Protected Culitvation

E.A. Maginnes and $14,467.00
G.H. Green
Department of Horticulture
University of Saskatchewan

During the past year research has continued on heating the experimental greenhouse at the Lanigan Potash Mine by passing warm mine exhaust between the two layers of polyethylene covering the structure. Exhaust air at mine level is 27°C (80°F) and has the potential of reducing heating costs by 80 per cent. However, air infiltration through the heat frame at ground level reduces the temperature to as low as 15.5°C (60°F) during the coldest part of the year. Under these conditions there is no potential energy saving.

Reduction in the amount of fine dust in the exhaust has proven to be uneconomical. Further, dust that built up on the inner poly layer could not be satisfactorily removed.

In order to overcome the dust-heating problem, an experiment is being conducted to introduce the air directly into the greenhouse in a system of perforated ducts.

Vegetable Varietal Trial 1982

C. Oliver Green $4,650.00
Prairie Produce Ltd.
Outlook

In 1982 selections of broccoli, cherry tomato, cantaloupe, and watermelon were tested in ten metre row trials, while cauliflower and red cabbage varieties were placed in a replicated plot. Trial sweet corn was tested on a field scale basis.

Broccoli Sixteen selections were tested including Cleopatra, Green Duke, Bravo, Green Dwarf, Italian Sprouting, Atlantic, Spartan, Waltham, Futura, Orion, Appollo, Gem (Asgrow), Premium Green, Gem (McKenzie), Green Hornet, and Green Mountain. Green Duke and Bravo followed by Gem, Orion, and Futura were the better performers in terms of yield and quality.

Red Cabbage Six varieties—Mammoth, Red Rock, Meteor Red Storage 4044, Storage Red, Red Danish and Hybrid Red Head were tested in a replicated plot trial. Hybrid Red Head and Red Storage 4044 significantly outyielded the others while Red Storage 4044 produced the heavier weight per head.

Cauliflower Five varieties—Snowcrown (McKenzie), Snowcrown (Stokes), Y Improved, Snowflower and Snowball X were similarly grown in a replicated trial. Snowcrown was earliest but lacked adequate self-blanching character while the others were more suitable. There was no significant yield differences between the varieties although Snowcrown followed by Snowball X and Y Improved were the better performers.

Red Cherry Tomato Three varieties—Sweet 100, Minibel and Tiny Tim were tested. Sweet 100 was the best yielder with the most uniform smallest fruit and sweetest flavor. The foliage, however, was very dense which made picking very difficult.

Cantaloupe Eight varieties were grown, but no meaningful data were obtained.

Watermelon Six varieties were grown, but no meaningful data was obtained.

Sweet Corn Five varieties were tested on a field scale basis. Sunny Vee matured earliest followed by Golden Beauty, Aztec, XP2500 and Calico in that order. Both Golden Beauty and Aztec were suitable for main crop production with Aztec being the best yielder. Limited production of Sunny Vee is warranted for early market. Both XP2500 and Calico has large ears with exceptional quality, however, their late maturity limits their commercial acceptability.

Ruminants

The Intensification of Sheep Production in the Prairie Environment

N.C. Rawlings, $28,178.00
I.A. Jeffcoate, and
W.E. Howell
Western College of Veterinary Medicine
University of Saskatchewan

The objective of this project is to develop and demonstrate management schemes, involving reproduction manipulation, to remove the seasonability and to improve the productivity of sheep production. The duration of the breeding season (time from when 80% of the ewes first showed estrus to when 80% were anestrus) was 126 days for Suffolk ewes, 154 for Columbia, 157 for Rambouillet, 217 for Finn x Columbia ewes and 210 for Rambouillet x Finn ewes. During the breeding season all five breed types responded as well to estrous synchronization using progestin containing intravaginal sponges. The use of Pregnant Mares' Serum Gonadotropin (500 units) (P.M.S.G.), given on the day of sponge removal, did not improve fertility, but did improve the synchrony of breeding. The Finn cross ewes produced more lambs per ewe. Out of season the success of estrous synchronization using P.M.S.G. and progestin containing intravaginal sponge was lower in ewes bred under natural daylight, but ewes bred after daylength manipulation (ewes were exposed to 18 hours of light for 30 days in January, then light was decreased 30 minutes per week until breeding in early May) responded almost as well as ewes bred during the breeding season. Horomone changes during estrous synchronization were also studied and at present a 5-year scheme is in place to study the economics of year round lamb production.

A Study of the Effect of B-Carotene On Reproduction in Cattle

F. Bristol $17,000.00
Western College of Veterinary Medicine
University of Saskatchewan

Three dairy herds with poor reproductive performance and marginally low (less than 300ug/100ml) plasma B-carotene levels were used in this experiment. Thirty cows in each herd were randomly divided into 2 groups shortly after parturition. One group was fed a supplement containing 200 mg of B-carotene per day while the other group was given a supplement without B-carotene. The supplements were fed for 100 days after parturition.

In these three herds the plasma B-carotene levels did not reach low levels until January and preliminary data indicated that supplementation with B-carotene at the rate of 200 mg/day will increase the plasma levels to 450 ug/100 ml. The effect of this supplementation on reproductive performance has not been analyzed as the experiment is still in progress.

The Evaluation of the Effects of Sulfates and Other Elements in Drinking Water On Trace Mineral Requirements of Cattle

C.M. Williams, $17,000.00
M.E. Smart,
D.A. Christensen,
R.D.H. Cohen
Department of Animal & Poultry Science
University of Saskatchewan

A farm scale water treatment plant has been installed which removes sulfates and other salts from the drinking water of cattle by reverse osmosis. Pregnant Hereford cows and heifers were divided into four groups:
1) Cows receiving untreated drinking water.
2) Cows receiving treated drinking water.
3) Heifers receiving untreated drinking water.
4) Heifers receiving treated drinking water.

All cattle received a mineral supplement which provided 10 mg Cu/kg dietary dry matter.

Blood and liver biopsy samples were collected in fall when cattle came off pasture, at calving and

in spring immediately before cows and calves were turned out to pasture.

Reverse osmosis treatment of drinking water significantly increased the copper status of cows determined from copper levels in liver biopsy samples ($P<0.05$).

Improvement of Provincial Sheep Flock (Investigation of Techniques Like A.I. and Embryo Transfer)

G. Tosh, $10,350.00
D. Donald, and
J. Nohachowsky
Rockhaven

This project sought to establish the techniques of artificial insemination and embryo transfer in our research programme and to evaluate their usefulness for the prairie sheep industry. A useful technique has been established for collecting ram semen on farm and application of A.I. in estrous synchronized ewes is in progress. Twelve ewes were superovulated after estrus synchronization using progestin containing intravaginal sponges. Six ewes received 1,100 units of pregnant mares serum gonadotropin (P.M.S.G.) 24 hours before sponge removal and 6 a graded dose of Follicle Stimulating hormone from pig pituitaries (FSH-P) starting at the same time. The FSH-P injections were given every 12 hours, two injections of 5 mg, two of 4 mg and two of 3 mg. Ewes were bred and blood sampled around estrus for hormone analysis. Eggs were flushed from ewes 6 days after estrus. Six recipient ewes receiving 12 viable fertilized eggs 6 days after estrus were pregnant at day 20. Ovulation rates were good in both sets of donor ewes, but both treatments produced variable results (3 to 8 corpora lutea in P.M.S.G. treated ewes with 1 to 4 unovulated follicle, 1 to 17 corpora lutea in FSH-P treated ewes with 1 to 5 unovulated follicles). Egg recoveries after flushing the upper half of the uterine horn were variable, and very low if only the upper third of the horn was flushed.

Embryo Transfer in the Cow: Effects of PMSG and FSH on Superovulatory Response, Ova Recovered, Ova Fertilized and Endocrinology

R.J. Mapletoft $20,000.00
Western College of Veterinary Medicine
University of Saskatchewan

A study was designed to compare the use of pregnant mares serum gonadotropin (PMSG) and follicle stimulating hormone (FSH) in the superovulatory program with the overall objective of improving the utilization of bovine embryo transfer.

Thirty Simmental cross cows were treated on day 10 ± 2 of their cycle with a single injection of 2250 I.U. of PMSG or twice daily treatments of decreasing doses of FSHP for five days (total dose 30 mg). Seventy-two hours after initiation of treatment, cows received a luteolytic dose of prostaglandin F2a (cloprostenol). At heat (on day 6 of treatment), cows were bred naturally at least twice with a fertility tested Angus bull. Embryos were collected nonsurgically seven days after the onset of heat and were classified as fertilized or not fertilized, and if so, whether they were degenerate. Blood samples were collected daily and were assayed for prostesterone estradiol and luteinizing hormone.

There were no significant differences between PMSG treatment and FSH treatment in numbers of ovulations (15.5 vs 13.2); total ova recovered (8.1 vs 8.6); fertilized ova (3.0 vs 4.8); fertilization rate (37% vs 56%); transferrable ova (2.7 vs 4.8); recovery rate (53% vs 65%); or interval from cloprostenol to heat (55 hr. vs 50 hr.). However, there were nearly two more transferrable ova per cow in the FSH group. Similarly, nearly 15% more ova were recovered in the FSH group. Although hormone perameters did not provide any particular insight into differences in response, hormone abnormalities may have contributed to the apparent problems associated with PMSG treatment.

Studies on Selenium Status in Wintering Beef Cattle

B. Laarveld, $16,930.00
M.E. Smart and
D.A. Christensen
Department of Animal and Poultry Science
University of Saskatchewan

The objective of this study is to: a) measure selenium status of wintering beef cows and calves maintained at the University of Saskatchewan Termuende Farm; b) determine the interactions between diet, sulphate level in drinking water and selenium status; and c) determine seasonal and breed effects in selenium status.

The study is nearing the final stage with approximately 80% of all the chemical analyses complete. The data have not as yet been statistically analyzed. Some preliminary observations, yet not conclusive, are presented. The cow/calf herd at the Termuende Farm appeared to have marginally adaquate selenium status. There were some seasonal fluctuations in selenium status, but these were of little significance. There did not appear to be any breed or diet effects. Treatment of drinking water by reverse osmosis to remove sulphates did not change selenium status. All calves showed low plasma selenium levels at birth and at 4 days after birth indicating low selenium status. Their selenium status improved somewhat with time but remained marginal.

The preliminary results indicate that selenium status of cows and calves at the Termuende Farm was not optimal. Further studies are required to determine required supplementation of selenium and its effect on animal performance and health.

Non Ruminants

The Implementation and Demonstration of an Improved Post-Weaning Environment for Pigs and the Resultant Influence on Productivity in Respiratory Disease Pathology

H. Fast, $35,179.00
S.D. Acres, and
P. Willson
Veterinary Infectious Disease Organization
University of Saskatchewan

The impact of different nursery systems on the level of respiratory diseases in, and the production performance of pigs was evaluated. A room nursery, for use in herds having more than 100 sows, was designed and constructed and the performance of pigs weaned into the all-in-all-out nursery rooms was compared to that of pigs weaned onto traditional raised flat decks occupied on a continual basis. There was a significant improvement in the average daily gain and a significant reduction in the mortality rate of pigs weaned into the all-in-all-out nursery rooms compared to the flat deck system. When the nursery rooms were fitted with an electrostatic air filter there was a further improvement in average daily gain and a decrease in the amount of pneumonia seen at slaughter. However, commercially available electrostatic air filters did not have the capacity necessary to adequately service nursery rooms and they cannot be recommended for use in commercial herds. Inexpensive plywood box nurseries for use in herds having fewer than 70 sows were also constructed and used in two commercial herds. The pigs weaned into the box nurseries did not show any significant improvement in production performance or health status. Hence, they appear to be of little use during the post-weaning period.

The Influence of Nutritional Density on the Productivity of Chicken Broilers

H.L. Classen $29,060.00
G.L. Campbell,
R.K. McMillan and
R.E. Salmon
Department of Animal and Poultry Science
University of Saskatchewan

A total of 5760 chicks were utilized in three trials designed to study the influence of feed ingredients on the performance of chicken broilers fed diets varying in nutrient density. Canola meal and raw faba beans included as 20% of the total diet were studied in trials one and two, respectively, while triticale was examined as a feed ingredient in trial three. Each test ingredient was included in five diets of varying nutrient density and compared to isonitrogenous and isocaloric diets formulated with wheat, barley, soybean meal and tallow as major ingredients. Reducing nutrient density decreased body weight at seven weeks of age, efficiency of feed utilization and carcass grades for fleshing and fat. Mortality due to acute or sudden death syndrome was slightly reduced by lower density feeding regimes while the incidence of leg problems was unaffected. The feed ingredients studied did not markedly influence the response of broilers to different dietary nutrient density. Productivity of broilers was affected by trial but the response to nutrient density changes remained similar.

The Feasibility of Utilizing Saskatchewan Reared Honeybee Queens in Commercial Honey Production

T. Taylor, $15,000.00
S. Clifford
Nipawin

Continuous overwintering of honeybee colonies in Northern climates is beset with two problems: 1. the loss of colonies through unsuccessful natural queen superceedures and overwintering hardships; 2. the need to maintain colony numbers as a direct result of these losses. This need is now serviced by importing package bees from the United States each spring. Two techniques of queen replacement was tested; 1. brood and queen transfers showed that from 45% to 66% of treated colonies accepted and maintained the newly introduced queens; 2. Cell technique: inclement weather in the fall prevented the final colony checks to determine the success level achieved. Spring 1983 inspections will reveal the required information.

Colony losses can reasonably be expected to be made up from within the bee operation itself. Full strength colonies were divided into a number of smaller colonies and queen cells were added. These colonies developed during the ensueing summer to nearly equal the populations of the producing colonies by September. The current technique used would indicate that replacement colonies produced by this method would compete favorably on a cost basis with the alternative of buying package bees from the United States.

The Ecology of Thamnophis radix in Southeastern Saskatchewan

D.M. Secoy and $3,900.00
M. Selinger-Dukart
Department of Biology
University of Regina

A population of the plains garter snake, the most abundant reptile in the province of Saskatchewan, was studied near Kronau. The study site was a portion of the Manybone Creek valley with grassland interrupted by patches of shrubs and herbaceous species along the creek.

Over the two field seasons 241 individuals were marked, and recaptured 755 times. The population in 1982 was 50.5% adult (27.3% male, 23.2% female) and 49.5% juvenile or young-of-the-year. In that year 30.4% of the females were gravid, indicating variation from an annual breeding cycle. Growth was variable.

The population did not migrate from the creek area. The average home range of the adults was 1.6 hectares with no defense of home range and considerable overlap. The population dens in rodent burrows and the root systems of various plants. Food found in the snakes were from the creek, being comprised mainly of leeches and small fish, with tadpoles and aquatic insect larvae.

The Economics of Wheat and Grain/Protein Ratios in Growing/Finishing Hog Rations

R. Blair — $25,000.00
K.A. Rosassen,
V.J. Racz &
B. Rakshit
Prairie Swine Center

A total of 240 swine (168 castrates and 72 gilts) were employed in 4 blocks, over the weight range 20 to 100 kg. They were grouped 6 or 12 to a pen on a sex-separated basis and fed one of 4 grower diets (Diets EW 1 to 4) up to 50 kg, followed by one of 4 finisher diets (Diets EW 5 to 8) from 50 to 100 kg liveweight. All diets were fed *ad libitum* and were based on corn, wheat/barley, or barley. Those based on corn (EW 1/EW 5) and wheat/barley (EW 2/EW 6) were formulated to meet the NRC standards for energy and protein. One barley diet (EW 3/EW 7) supplied the NRC level of protein but with a reduced energy level similar to that found in Western Canadian diets. The other barley diet (EW 4/EW 8) contained the same reduced energy level, but with the same energy/protein ratio as in the corn and wheat-based diets.

Digestiblity of dry matter and protein were higher in the corn and wheat-based diets than in the barley-based diets. The corn-based diet resulted in the fastest and most efficient growth in young growing swine, and the wheat-based diet resulted in slower growth that was comparable with that obtained with the barley diet containing the same protein level. The preliminary results from one block suggested that protein level rather than energy level has a critical effect on the growth of young growing swine. They also suggested that there may be little or no benefit from the inclusion of wheat in grower diets for swine.

Traction of Sows on Farrowing Crate Floors

G.I. Christison — $20,000.00
Department of Animal and Poultry Science
University of Saskatchewan

The foothold of sows while in farrowing crates has an important influence on the number of newborn pigs which are crushed by the sow. One potential method of evaluating a sow's foothold was to determine her ability to haul a load while walking on floors of different types. When trained sows were used, however, the floor-to-floor differences were too small to provide a useful method of distinguishing among floor types. Other data has been collected on the frequency and duration with which sows stand, sit or lie while in crates on four different floor types. This data has not been analyzed. Preliminary work with high speed filming has shown vast differences in foot slippage while on different floor types; future trials will concentrate on this method of evaluating traction.

Land, Air, Water

Methodology for Rapid Measurement of Field Moisture

Dr. D.R. Cameron — $8,500.00
Normac Enterprises Ltd.
Swift Current

The purpose of this study was to develop a soil moisture assessment method for use as a routine service by soil sampling agents. In initial field testing tensiometers and resistance block instruments were too slow; neutron and infrared techniques too expensive and the new time domain reflectometry, dielectric measurements and passive microwave required more development. The moisture depth probe, direct electrical resistance and a hand rating system based on texture and feel were field tested in co-operation with seven Saskatchewan soil test agents. Within field the correlation between these measurements and actual moisture content was low as the measurement variability of the technique was greater than the moisture variability. Significant correlations were obtained over the whole population of fields. The depth probe showed the best correlation in heavier textured soils and appeared to be the simplest method. The hand rating system showed a significant correlation to moisture content after converting from field capacity to total moisture. This system showed the greatest potential for field moisture estimation and could be readily used by soil test agents. The microwave oven provided a very rapid and accurate method for moisture measurement during sample preparation. Estimating the total moisture from one or two air drying weight losses, tested on heavy clay soils, was too slow and subject to error. The Ohaus moisture balance was qualitatively tested and appeared to work on powdery or granular soils but would require the establishment of drying settings for routine use.

Studies on the Efficient Utilization of Liquid Hog Manure

L.A. McLean and — $16,500.00
L. Henry
Crop Science Department
University of Saskatchewan

Liquid hog manure was applied to established alfalfa at rates up to 16,000 gallons per acre and to barley at rates up to 8,000 gallons per acre with three separate placement techniques. Yield increases of approximately 960 kg/ha were measured on the barley experiment. The liquid hog manure was found to contain 10 lbs. N, 2 lbs. P_2O_5 and 5 lbs. K_2O per 1000 gallons. These results were similar to those acheived in 1981 where the grain yield was increased by 500 kg/ha and the forage 700 kg/ha.

Micronutrient Status and Transformations in Saskatchewan Soils

R.E. Karamanos and J.J. Germida
Department of Soil Science
University of Saskatchewan
$23,000.00

An exploratory survey of yield responses by micronutrient fertilization, in various areas of Saskatchewan was carried out in 1982. A total of 79 treatments of micronutrient fertilization were applied at 36 sites selected in 18 areas of Saskatchewan. This study revealed that areas of possible concern include sandy and eroded soils, calcareous soils, organic soils, and soils where intensified production practices (such as irrigation) are followed.

Some micronutrient toxicity effects were observed at a few sites where application rates exceeded the recommended level for the placement method used. This indicates the importance of using correct rates and methods of placement, and the data obtained indicates that micronutrients should not be applied indiscriminately to soils in Saskatchewan.

Four extractants, DTPA, EDTA, 1 N NH_4OAc, and 0.1 N HC1 were evaluated on the basis of their ability to predict Zn and Cu deficiencies using nine Saskatchewan soils and alfalfa as a test crop. The DTPA test was found to be most suitable as an index of Zn deficient soils with a "critical" value for Zn deficiency of 1.1 ug/g of soil. The results obtained for Cu were inconclusive.

Energy and Equipment

Energy-Deep Till Discer Seeder

W.B. Reed
Agricultural Engineering Department
University of Saskatchewan
$12,230.00

A pneumatic seeding attachment added to a MF No. 36, 15 foot wide machine was used to permit deep tillage, deep banding of fertilizer and seeding at normal depths while applying Avadex BW for wild oat control. Field trials during 1982 indicated seeding depths of 43 mm and 16 mm with wheat and canola respectively as compared to 47 mm deep when seeding wheat with a conventional discer and 20 mm with a double disc drill. The average yield of wheat with the Deep Till Discer was 3411 kg/ha compared to 3182 kg/ha with a conventional discer, but there was no statistical difference in yield. There was relatively poor establishment of the Canola crop with the discer seeder, partly attributable to deeper and less uniform placement of the seed. Heavy infestations of broad-leaved weeds reduced yields with the discer seeding yielding about one-half that of the drill seeded plots.

Leduc Dryland Weed Patrol — A Flexible Floating Subsurface Wide Sweep Tillage Implement

L. Leduc
Assiniboia
$4,500.00

The Leduc Dryland Weed Patrol tillage implement is intended for use after a field has been worked with a heavy duty cultivator. The independently mounted 36 inch wide sweeps remain parallel to the ground at all times. Mounting the sweeps on a pivot allow them to follow the contours of the land and by-pass stones. The wings fold backward remaining on the ground thereby reducing the danger of contact with over head lines.

Evaluation and Comparison of the Spinning Disc (CDA) and Low Pressure Nozzles with Conventional Flat Fan Nozzles

D.G. Pchajek and D.C. Campbell
Saskatchewan Wheat Pool
$9,450.00

Three replicated small plot experiments were conducted in two seasons to evaluate the efficacy of diclofop methyl, bromoxynil/MCPA, 2,4-D, DPX4189, paraquat and glyphosate when applied with TeeJet 8002, 8002LP, 8001 and CDA nozzles. In addition the mechanical reliability of the CDA was evaluated. For in crop weed control, diclofop methyl, 2,4-D, bromoxynil/MCPA and DPX4189 all provided the best overall control when applied with TeeJet 8002 or 8002LP nozzles. In chemical fallow TeeJet 8002 or 8002LP nozzles provided paraquat with the greatest efficacy on a broad spectrum of weeds. The results with glyphosate were more variable. Reduced water volume (8001 or CDA) had little effect on efficacy. If herbicide rates were reduced, TeeJet 8001 nozzles were superior to the CDA. With all herbicide tested in no case was the CDA superior to currently recommended hydraulic nozzles. Mechanical performance of the CDA was found to be adequate. However, more care is required in the day to day operation and maintenance of the CDA units.

Socio-Economics

The Economics Organization of Rural Households in Saskatchewan

W.H. Furtan and J.S. Clark
Department of Agricultural Economics
University of Saskatchewan
$10,000.00

One of the major centres of economic activity is within the household. The allocation of time, expenditures and savings are all made within the household. Also decisions as to the number and quality of children are choices that eminate from the household. The choices made within the household also have a direct bearing on the size and type of farm, primarily through the labour market.

The purpose of this research project was to build an economics model of household decisions. A sample of 630 farms taken from the Western Grain Stabilization list were personally interviewed. The data was placed on the computer and analyzed using the new household economics.

The research found farms to be increasing in size and little in the future to stop further growth. The income level of farm households was also explained using such variables as education, inheritance and market luck. Finally, family size and time allocation was explained using the new household economics.

Miscellaneous

Strain Improvement Approaches in *Zymomonas Mobilis*

G.G. Khachatourians, $19,830.00
Ka-Yin Leung and
T.L. Haffie
Department of Applied Microbiology and Food Science
University of Saskatchewan

The bacterium *Z. mobilis* can yield 7-12% ethanol only from glucose, sucrose and fructose. In order to broaden the fermentative substrate range, alcohol tolerance strain improvements are being explored.

Our strategies for such strain improvements include studies on bacterial conjugation and selection, and endogenous plasmid DNA.

The frequency of the conjugal transfer of F- and R- plasmids into *Z. mobilis* is very low and in the order of 10^{-7} to 10^{-8}. The reasons for the low frequency of mating have been researched and shown to be due to the presence of ethanol and other metabolites normally found in growing cultures of *Z. mobilis* or, incompatibility by resident plasmids.

The presence of endogenous plasmid DNA in *Z. mobilis* was examined. *Z. mobilis* strains GK650 and 651 were lysed and their cellular DNA contents were purified. Chromosomal and plasmid DNA were analysed by dye-buoyant density gradient ultracentrifugation. Plasmid DNA were dialyzed and separated electrophoretically on agarose gels. Two plasmids were found in strain GK651 and four plasmids in GK650.

The results of our findings should allow us to overcome the *in vivo* and *in vitro* aspects of genetic engineering and improvement of the carbohydrate utilizing ability of *Z. mobilis*.

Sanitizer Residues in Milk and Milk Products in Saskatchewan

E.S. Humbert and $18,400.00
G. Blankenagel
Department of Applied Microbiology and Food Science
University of Saskatchewan

To determine the importance of milk as a possible major contributor to the dietary intake of iodine, 359 fluid and industrial farm bulk tank milk samples were examined for iodine levels. The average iodine value for all producers was found to be 0.929 ppm with fluid milks having a higher concentration (0.990 ppm) than industrial milks (0.677 ppm). Results showed individual producers' milk ranging from 0.1 to 5.0 ppm iodine with 20% of the milk samples exceeding 1.0 ppm. Of the 41 producers which were selected for a further nine-month study, semi-monthly analyses indicated little variations in concentration, with milks of low initial iodine values generally remaining low and those with high values usually remaining high. Farm inspections suggest that feeds, in particular those supplemented with iodine, are primarily responsible for the increased iodine levels while farm iodine compounds commonly used in normal milking operations are believed to be less important. The use of iodine-containing teat dips and udder washes with selected cows of the University of Saskatchewan herd did not contribute to any noticeable increase in milk iodine levels. Iodine contents of cottage cheese were influenced by the use of iodine treated wash waters with a direct correlation between levels of iodine in the wash water and that in cottage cheese curd. Results of this study suggest that those farmers producing milk containing abnormally high iodine values be reexamined and steps taken to reduce these values to more acceptable concentrations.

Saskatchewan Agricultural Research Fund

Financial Statements

For the Year Ended March 31, 1983
Office of the Provincial Auditor
Regina, Saskatchewan

Auditor's Report

To the Members of the Legislative Assembly
Province of Saskatchewan

I have examined the balance sheet of the Saskatchewan Agricultural Research Fund as at March 31, 1983 and the statement of revenue, expenditure and fund balance for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1983 and the results of its operations for the year then ended in accordance with the stated basis of accounting, described in Note 1, applied on a basis consistent with that of the preceding year.

W. G. Lutz, F.C.A.
Provincial Auditor

Regina, Saskatchewan
April 21, 1983

Statement 1

SASKATCHEWAN AGRICULTURAL RESEARCH FUND
BALANCE SHEET
March 31, 1983

(with comparative figures at March 31, 1982)

	1983	1982
Assets:		
Cash in bank	$ —	$ 2,107
Investments — at cost (Schedule 1)	3,998,405	3,960,316
Accrued interest receivable	57,086	51,322
	$4,055,491	$4,013,745
Liabilities and Fund Balance		
Liabilities:		
Bank Indebtedness	$ 836	$ —
Grants committed, but not paid	772,139	590,370
Accounts payable	—	942
	$ 772,975	$ 591,312
Surplus:		
Capital funds (Note 3)	$3,250,000	$3,250,000
Funds available for grants	32,516	172,433
Fund balance	3,282,516	3,422,433
	$4,055,491	$4,013,745

(See accompanying notes to the financial statements)

Statement 2

SASKATCHEWAN AGRICULTURAL RESEARCH FUND
STATEMENT OF REVENUE, EXPENDITURE AND FUND BALANCE
For the Year Ended March 31, 1983

	1983	1982
Revenue:		
Investment Interest	$ 538,248	$ 591,587
Total Revenue	538,248	591,587
Expenditure:		
Grants committed during the year	672,000	595,649
Board expenses	2,951	3,963
Printing costs	3,214	1,382
Total Expenditure	678,165	600,994
Excess of revenue over expenditure	(139,917)	(9,407)
Fund balance, beginning of year	3,422,433	3,431,840
Fund balance, end of year	$3,282,516	$3,422,433
Represented by:		
Capital funds (Note 3)	$3,250,000	$3,250,000
Funds available for grants	32,516	172,433
	$3,282,516	$3,422,433

(See accompanying notes to the financial statements)

SASKATCHEWAN AGRICULTURAL RESEARCH FUND
NOTES TO FINANCIAL STATEMENTS
March 31, 1983

1. Accounting Policies

a) Grant Commitment

Grant commitments are recorded as an expenditure of the Fund at the point in time the Saskatchewan Agricultural Research Fund Board approves the grant. Grants committed but not paid at the year end are reflected as a liability on the balance sheet.

b) Costs Borne by Other Agencies

In accordance with established government practice, the Saskatchewan Agricultural Research Fund has not been charged with any occupancy costs and no provision for such costs is reflected in these financial statements. These costs together with certain general administrative and employee benefit costs are absorbed by various departmental appropriations.

2. Incorporation

The Saskatchewan Agricultural Research Fund was incorporated under The Agricultural Research Funding Act, Chapter A-14.1, 1978 Revised Statutes of Saskatchewan. This Act came into force by proclamation of the Lieutenant Governor on June 15, 1979. The Saskatchewan Agricultural Research Fund is a capital fund from which grants are made to individuals, corporations, co-operatives, partnerships, associations or other organizations for the purpose of agricultural research in the province.

3. Restriction of Funds

This Fund was initially financed with an appropriation of $3.25 million. The intention of the Saskatchewan Agricultural Research Fund Board is that only the investment income on this $3.25 million will be made available for expenditures.

Schedule 1

Saskatchewan Agricultural Research Fund
Summary of Investments
As at March 31, 1983

Description	Rate	Maturity Date	Amount
Bank of Montreal Promissory Note	10.20	April 7, 1983	$ 679,492
Barclays Bank Bearer Discount Note	9.60	April 11, 1983	9,769
A Standard and Chartered Bank Bearer Discount Note	10.20	April 14, 1983	14,513
Royal Bank Bankers Acceptance Papers	9.50	April 18, 1983	4,884
Guaranty Trust Company of Canada Guaranteed Trust Certificate	14.25	April 25, 1983	1,000,000
Roymor Promissory Note	10.00	May 5, 1983	4,878
Bank of Montreal Mortgage Corporation Promissory Note	10.00	May 10, 1983	14,604
Bank of Montreal Mortgage Corporation Promissory Note	10.05	May 18, 1983	155,504
Canadian Pacific Securities Limited Promissory Note	9.45	May 25, 1983	4,900
Candian Imperial Bank of Commerce Bankers Acceptance Papers	9.35	May 25, 1983	9,785
Royal Bank Bankers Acceptance Papers	10.20	May 31, 1983	19,139
Province of Quebec Treasury Bills	9.25	June 2, 1983	4,902
Bank of Montreal Mortgage Corporation Promissory Note	9.65	June 13, 1983	203,647
Royal Bank Bankers Acceptance Papers	9.30	June 23, 1983	9,783
First City Trust Guaranteed Investment Certificate	9.45	July 5, 1983	790,000
Canadian Pacific Securities Ltd. Promissory Note	9.45	July 5, 1983	67,789
Canadian Treasury Bill Canada	9.30	August 26, 1983	4,816
Canada Permanent Trust Guaranteed Investment Certificate	15.00	April 14, 1985	500,000
Canadian Imperial Bank of Canada Certificate of Deposit	12.00	June 17, 1985	500,000
Total Investments			$3,998,405

POOR

QUALITY

ORIGINAL